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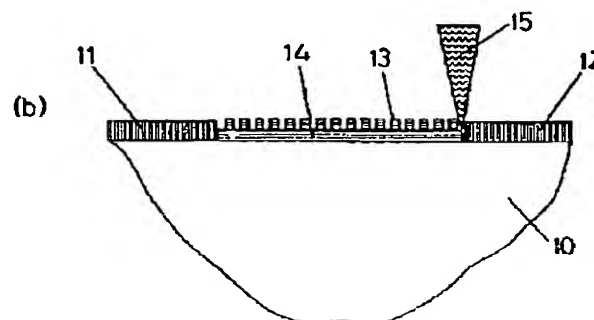
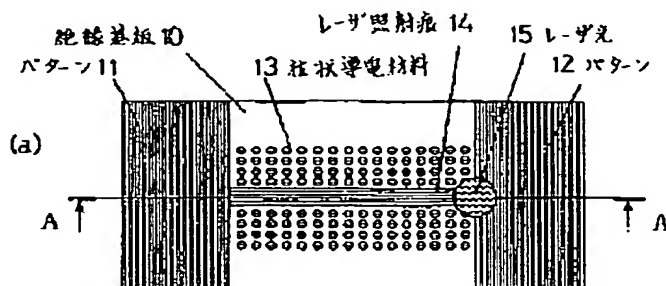
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TITLE : HEAT-CONDUCTIVE INSULATING MATERIAL, AND ITS HEATING METHOD



ABSTRACT : PROBLEM TO BE SOLVED: To provide a configuration of such heat-conducted insulating material as getting conductive when heated, together with its heating method.

SOLUTION: On an insulating substrate 10, pillar-like conductive materials 13 are evenly formed with no contact to each other, and such patterns 11 and 12 of a capacitor electrode, a resistor, an inductor, etc., are formed on the ceramics. The insulating substrate 10 is formed of, for example, ceramics, glass- epoxy resin, silicon, while the patterns 11 and 12 formed of, for example, such conductor as Cu. The pillar-like conductive material 13 comprises, for example, such alloy as Sn-Pb group, Sn-Ag group, Sn-Sb group, Sn-Bi group, Sn-Zn group, Sn-Cu group, In-Ag group, and Ag-Pd group. When the pillar-like conductive material 13 is irradiated with a laser light 15 as indicated with a laser irradiation mark 14, the pillar-like conductive material 13 is heated and melted, so that the pillar-like conductive material 13 are connected each other, for conduction between the pattern 11 and the pattern 12. When this is applied to a trimming part, adjustment is possible at both insulation and conduction while conventionally it was made in insulated condition. }

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the heating conductivity insulating material which will flow if it heats, and its heating method.

[0002]

[Description of the Prior Art] In recent years, the circuit adjustment by laser attracts attention from the request of the high quality of a circuit, high-reliability, cost reduction, and adjustment time amount compaction. Drawing 5 (a) is the perspective diagram showing the configuration of the trimming-machine bull capacitor by the conventional laser, and drawing 5 (b) is a cross section on the F-F line.

[0003] In both drawings, the terminal electrodes 51 and 52 are formed in the right-and-left both ends of a ceramic substrate 50, the electrode 53 for removal processing is formed in the surface center section of the ceramic substrate 50, and it connects with the terminal electrode 52. Moreover, an internal electrode 54 is formed in the inner layer of a ceramic substrate 50, and it connects with the terminal electrode 51. This internal electrode 54 is arranged so that the electrode 53 for removal processing and a capacitor may be formed.

[0004] In the above configuration, adjustment of the conventional trimming-machine bull capacitor irradiated laser so that it might be shown in the direction 55 of laser radiation, it shaved off the electrode 53 for removal processing, and was adjusting by decreasing electrostatic capacity.

[0005]

[Problem(s) to be Solved by the Invention] However, since adjustment of the capacitor by the above-mentioned conventional laser was removal processing of an electrode, it was adjustment of the one direction of only decreasing electrostatic capacity. For this reason, it is impossible to return what was adjusted once and the components and substrate which made an adjustment mistake were discarded. Moreover, in order to avoid an adjustment mistake, it was processed carefully and the problem of taking adjustment time amount was also generated.

[0006] In order that this invention may solve the above-mentioned conventional problem and may adjust electrostatic capacity flexibly, it aims at offering a heating conductivity insulating material and its heating method as a trimming electrode material.

[0007]

[Means for Solving the Problem] In order that this invention may solve the above-mentioned problem and may attain the purpose, it offers a material which made homogeneity distribute a conductive material in an insulating material, and a method of heating this material by laser. Although an insulation is maintained since an insulating material exists between conductive materials, by heating by laser, a conductive material of a heating part fuses, it connects mutually, and a flow comes to be obtained the first stage.

[0008] If a heating conductivity insulating material of this invention is used for an electrode for trimmings and heating by laser beam is performed, it becomes possible to make electrostatic capacity fluctuate and a high speed and quality adjustment can be performed.

[0009]

[Embodiment of the Invention] If invention according to claim 1 distributes a conductive material in an insulating material and a column or the shape of a drill, and adjustment form spherically, make it

arrange, use this for the capacitor for trimmings, resistance, and an inductor, and according to a laser beam according to claim 6 are performed for a conductive material on an insulating substrate like invention according to claim 2, it can make a characteristic value fluctuate freely now and the adjustment of a high speed and high quality of it will be attained.

[0010] The handling of components becomes simple and its insulating reliability also improves while invention according to claim 3 covers the column or the shape of a drill, and the spherical material upper part of a conductive material according to claim 2 with thermoplastics and acquires the same effect as above-mentioned claim 1 by this.

[0011] If invention according to claim 4 distributes a conductive particle in thermoplastics, and uses this for the capacitor for trimmings, resistance, and an inductor and adjustment by the laser beam according to claim 6 is performed, the same effect as above-mentioned claim 1 will be acquired.

[0012] Its insulating reliability improves while invention according to claim 5 covers the perimeter of a conductive particle according to claim 4 by thermoplastics covering and acquires the same effect as above-mentioned claim 1 by this.

[0013] Hereafter, it explains, referring to a drawing about the gestalt of each operation of this invention.

[0014] (Gestalt 1 of operation) Drawing 1 (a) and (b) show the configuration of the heating conductivity insulating material in the gestalt 1 of operation of this invention, drawing 1 (a) is a plan and drawing 1 (b) is an A-A view cross section.

[0015] As shown in drawing 1 (a) and (b), it is formed in homogeneity so that the pillar-shaped electrical conducting material 13 may not touch mutually on an insulating substrate 10. The patterns 11 and 12, such as a resistor, an electrode of a capacitor, and an inductor, are formed on this ceramic.

[0016] An insulating substrate 10 is formed with the ceramics, a glass-epoxy resin, silicon, etc., and patterns 11 and 12 are formed with conductors, such as Cu. The pillar-shaped electrical conducting material 13 consists of low melting alloys, such as for example, a Sn-Pb system, a Sn-Ag system, a Sn-Sb system, an Sn-Bi system, a Sn-Zn system, a Sn-Cu system, a Sn-Sb system, an In-Ag system, and an Ag-Pd system.

[0017] If a laser beam 15 is applied to the pillar-shaped electrical conducting material 13 on an insulating substrate 10 as shown in the laser radiation marks 14, the pillar-shaped electrical conducting material 13 can heat and fuse, each pillar-shaped electrical conducting material 13 can connect, and it can be made to flow through a pattern 11 and a pattern 12 in the above configuration. Flexible adjustment will be attained if this is used for the capacitor for trimmings, resistance, an inductor, etc.

[0018] In addition, an operation and an effect with the same said also of the ** else, for example, a drill, or a spherical electrical conducting material are acquired. [electrical conducting material / 13 / pillar-shaped]

[0019] (Gestalt 2 of operation) Drawing 2 (a) and (b) show the configuration of the heating conductivity insulating material in the gestalt 2 of operation of this invention, drawing 2 (a) is a plan and drawing 2 (b) is a B-B view cross section.

[0020] As shown in drawing 2 (a) and (b), in order to protect the pillar-shaped electrical conducting material 13 in the configuration shown with the gestalt 1 of operation, the upper surface is closed by the thermoplastic insulating material 16 of the low melting point.

[0021] The thermoplastic insulating material 16 consists of either of the thermoplastic synthetic resins, such as the rosin, various rubber or polyethylene, polypropylene, polystyrene, polytetrafluoroethylene, a polycarbonate, and a polyether.

[0022] In the above configuration, a surface protection can be planned and handling becomes easy. Moreover, if a laser beam 15 is applied to the pillar-shaped electrical conducting material 13 on an insulating substrate 10 as shown in the laser radiation marks 14, the pillar-shaped electrical conducting material 13 and the thermoplastic insulating material 16 will fuse, pillar-shaped electrical conducting material 13 comrades will join together, and a pattern 11 and a pattern 12 will flow.

[0023] (Gestalt 3 of operation) Drawing 3 (a) and (b) show the configuration of the heating conductivity insulating material in the gestalt 3 of operation of this invention, drawing 3 (a) is a plan and drawing 3 (b) is a C-C view cross section.

[0024] As shown in drawing 3 (a) and (b), the heating conductivity insulating material 18 which made homogeneity distribute the conductive particle 17 is formed into the thermoplastic insulating material 16. Moreover, on a ceramic, the patterns 11 and 12, such as an electrode of a resistor and a capacitor, are formed.

[0025] An insulating substrate 10 is formed with the ceramics, a glass-epoxy resin, silicon, etc., and patterns 11 and 12 are formed with conductors, such as Cu. The conductive particle 17 consists of low melting alloys, such as for example, a Sn-Pb system, a Sn-Ag system, an Sn-Sb system, a Sn-Bi system, a Sn-Zn system, a Sn-Cu system, a Sn-Sb system, an In-Ag system, and an Ag-Pd system. The thermoplastic insulating material 16 is formed from either of the thermoplastic synthetic resins, such as the rosin, various rubber or polyethylene, polypropylene, polystyrene, poly tetrafluoroethylene, a polycarbonate, and a polyether.

[0026] If a laser beam 15 is applied to the heating conductivity insulating material 18 as shown in the laser radiation marks 14, the thermoplastic insulating material 16 and the conductive particle 17 can fuse, conductive particle 17 comrades can connect, and it can be made to flow through a pattern 11 and a pattern 12 in the above configuration. Flexible adjustment will be attained if this is used for the capacitor for trimmings, resistance, an inductor, etc.

[0027] (Gestalt 4 of operation) Drawing 4 (a), (b), and (c) show the configuration of the heating conductivity insulating material in the gestalt 4 of operation of this invention, and drawing 4 (a) is [a D-D view cross section and drawing 4 (c) of a plan and drawing 4 (b)] the E section enlarged views of drawing 4 (b).

[0028] As shown in drawing 4 (c), in order to prevent contact of conductive particle 17 comrades, the conductive particle 17 is covered by the thermoplastics covering 19. The thermoplastic insulating material 16 is formed from either of the thermoplastic synthetic resins, such as the rosin, various rubber or polyethylene, polypropylene, polystyrene, poly tetrafluoroethylene, a polycarbonate, and a polyether.

[0029] In the above configuration, it becomes possible by coating the perimeter of the conductive particle 17 with the thermoplastics covering 19 beforehand to raise insulating reliability. Moreover, if a laser beam 15 is applied to the heating conductivity insulating material 18 as shown in the laser radiation marks 14, the conductive particle 17, the thermoplastic insulating material 16, and the thermoplastics covering 19 can fuse, conductive particle 17 comrades can connect, and it can be made to flow through a pattern 11 and a pattern 12.

[0030]

[Effect of the Invention] A conductive material is distributed on an insulating substrate or in an insulating material at homogeneity, a conductive material is fused and connected by applying heat with laser, and it enables it to take a flow according to this invention, as explained above. If this conductive insulating material and the heating method by laser are used for laser trimming components, it becomes possible to also perform adjustment which increases what was adjustment of only lowering electrostatic capacity conventionally to coincidence, and circuit adjustment of a high speed and high degree of accuracy can be offered.

[Translation done.]

Zusammenfassung